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Treatment outcome in cases of Acute Kidney Disease in dogs with conventional treatment

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Renal insufficiency is a common finding in dogs and cats (Kovarikova 2015). Acute Kidney Injury (AKI) is characterized by a sudden loss of functioning capacity of nephron, resulting in azotemia, electrolyte, acid-base imbalance and azotemia (Bonagura and Twedt 2009). AKI is seen when a sudden, severe insult damages the kidneys irrespective of the etiology. ARF can be pre-renal, renal and post renal depending upon the underlying cause (Brown *et al.,* 2013). Hemodynamic decline (e.g. hypotension and hypovolemia), infectious (e.g. leptospirosis and pyelonephritis), nephrotoxic agent exposure (e.g. nonsteroidal anti-inflammatory drugs and lily poisoning), and obstruction of the urinary tract (e.g. urolithiasis, inflammation) are the most frequently recorded AKI factors (Lee *et al*., 2012).

Anorexia, dehydration, lethargy, oral ulceration, halitosis, vomition, diarrhoea and oliguria with or without enlarged painful kidneys are all symptoms observed during initial stages of acute kidney insufficiency (Aiello and Moses 2016). Dogs with gastrointestinal symptoms (vomiting or diarrhoea) or abnormal electrolyte metabolism (high phosphorus, potassium and low chloride levels) had a consistently poor prognosis because such dogs were found to be more likely to succumb to AKI (Ross 2011).

The study included 26 dogs presented with the signs of anorexia, vomition, lethargic, oliguria or anuria, melena at Multispecialty Veterinary Hospital of GADVASU, Ludhiana. Dogs with serum creatinine levels of ≥ 1.6 mg/dL and BUN ≥ 25 mg/dL with the duration of clinical signs not more than 1 week were selected. After thorough clinical examination and concurrent history, these dogs were subjected to detailed haematological parameters like Hb, PCV, TLC, DLC, platelet count, TEC, absolute neutrophil count and absolute lymphocyte count. Biochemical includes BUN, Cr, ALT, AST, TP, ALB, GLB, GGT, ALKP etc., routine urinalysis and diagnostic imaging techniques (Radiography, ultrasonography) for further investigation. Based on increased serum BUN, Cr and preserved architectural details in ultrasonography along with isothenuric urine paved way for cases selection and were subjected for further investigation and biomarkers examination.

Ten (10) out of 26 dogs with varying degree of AKI and undefined etiology were treated with fluid therapy, broad spectrum antibiotics, diuretics, antacids, anti-emetics, vitamin and mineral support along with renal protectants (Table 1). Out of which, 7 dogs survived and 3 collapsed within a period of less than one week of starting the treatment. Treatment course varied from 1 week to 3 weeks and all animals were under periodic supervision and routinely assessed for hematobiochemical parameters and improvement (Table 2). All other dogs which survived are still continuously receiving omega -3 (syrup Vitabest) and heckler tablets and are living quality life.

Managing AKI includes two primary strategies: optimizing renal perfusion and regulation of intrarenal pathophysiological instruments of AKI and includes intravenous fluids, vasopressors and diuretics (Gonsalez *et al.*, 2019). Fluid therapy and diuretics were directed according to the clinical signs and the actual assessment of dehydration status with emphasis in promoting diuresis and promoting renal hemodynamic. Schetz (2004) emphasised continuous use of diuretics (furosemide) are of more use rather than bolus in AKI and increases significant urine output. Mannitol was used in 2 dogs and was efficient in inducing diuresis. Mannitol has additional effects of free radical scavenging and improving glomerular circulation *(Bagshaw et al.,* (2007).

For dogs with undefined etiology, the mean creatinine values before treatment was around 3.08 mg/dl and post treatment 1.47 mg/dl. Whereas the mean BUN before and after treatment was 44.6 mg/dl and 17 mg/dl respectively.This high BUN and creatinine levels in serum could be attributed to the excessive amount of production in comparison to the rate of clearance of these proteinaceous catabolites as glomerular filtration rates are significantly reduced in acute kidney injury cases (Coles, 1986). This study was in line with various other

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Table 1: List of drugs and dosage used for conventional treatment of cases with acute kidney injury

Drug	Dose rate		Route	Indications	No. of cases (n=10)
RL+DNS (5%)	Dehydration volume		I/V	Anorexia, Hypochloremia; Hyperkalemia Metabolic acidosis, Hyponatremia and Hypokalemia	1
	4-6 %	22 ml/kg			
RL+N/2 DNS	6-8 %	40 ml/kg			8
	8-10 %	80 ml/kg			
RL	10-12%	100ml/kg			2
Mannitol	0.25-1g/kg as a bolus over 20 minutes		I/V	Osmotic Diuretic, Increases RBF, GFR, solute excretion and Tubular flow	2
Metoclopramide, ondensetron	0.2-0.5 mg/kg bid		I/M, S/C, I/V	Vomition	9
Ranitidine	0.5-1 mg/kg bid		S/C, I/M	Antacid	10
Frusemide	2-4 mg/ kg bid		I/V, I/M	Oliguria, anuria	8
Polybion	1ml/10 kg od		I/M	Vitamin supplementation	10
Belamyl	1ml/10 kg od		I/M	Vitamin and Liver extract supplementation	2
Metronidazole	10-15 mg/kg bid		I/V	Neutrophilic leukocytosis	1
Ampicillin	10mg/kg bid		I/M, I/V		7
Enrofloxacin	5mg/kg bid		I/M, PO		2
Cefotaxime	20-25 mg/kg bid		I/M, I/V		1
Doxycycline	10mg/kg od		PO	Hemoprotozoan infection	1
Tranexamic acid	10 mg/kg stat		I/M	Hemorrhagic enteritis	2
sucralfate	10 ml total dose		PO	Gastro protectant	1
Vitamin C	100-500 mg total dose		I/V, PO	HGE,urinary Acidifier	4
Hematinic	10 ml, bid		PO	Anaemia	2
Plat grow	10 ml, bid		PO	Thrombocytopenia	1
Becosule	5ml,od		PO	B-complex	4
Vitabest	10 ml, od		PO	Omega 3, improve GFR	8
Gut well	1 tsf for 10kg od		PO	Gut dysbiosis	6
Heckler	1 tab, bid (up to 10 kg)		PO	Reno protective	10
Gelusil	$Al(OH)_3$, 40-100mg/kg bid		PO	Hyperphosphatemia	1

studies (Saravanan *et al*., 2012 and Jaturakan *et al.*, 2013) who also reported significant higher levels of BUN and creatinine in dogs suffering from AKI.

Cases with increased serum BUN and creatinine shown significant improvement after treatment and thus it can be concluded that serum BUN and creatinine concentrations are the most accurate and widely used markers for diagnosing and monitoring renal function, and their increase (azotemia/uremia) should be documented in dogs with renal insufficiency or renal disease (Jeong *et al.,* 2006 and Zygner *et al.,* 2007).

Urine specific gravity before and after treatment was 1.015 and 1.023 thus indicating efficient concentrating abilities of kidneys after the treatment as concentrated urine and urine osmolality are features of healthy kidneys (ALkharashi 2019).

Conclusions

Hemato-biochemical parameters like total erythrocyte count; lymphocyte count, total leucocyte

Table 2: Haematological and biochemical analysis in pre-treatment and post-treatment of dogs affected with acute kidney injury

Parameters	Reference range	Overall renal failure	
		Pre-treatment (n=10)	Post-treatment (n=7)
Hb (g/dL)	12-18	10.76±1.42[1] (3.9-15.8)[2] 12.6[3]	10.84±0.95 (5.9-13.9) 12
TEC ($\times 10^6$per mm^3)	5.5-8.5	4.87±0.57 (1.73-7.14) 5.76	5.26±0.41 (3.3-6.54) 5.88
PCV (%)	37-55	32.98±3.87 (12.4-49.5) 37.8	33.22±2.88 (18.1-42) 36
Platelet ($\times 10^3$per mm^3)	200-800	167.4±43.87 (18-432) 115.5	164.42±28.34 (69-333) 12.3
TLC (per mm^3)	6000-17000	19403^A ±4011.78 (4900-45280) 15675	10748.71^B ±969.88 (7400-16435) 11203
Absolute Neutrophil count (per mm^3)	3000-115000	17190.4±3839.8 (4312-42563.2) 13375.2	7610.7±582.4 (5550-9861) 8066.1
Absolute Lymphocyte count (per mm^3)	1000-4800	1878.08±262.1 (588-3190) 1901.6	3127.3±503.7 (1776-6574) 2825.7
N:L	2.1-8.84	8.64^A ±1.52 (3.16-15.33) 9	2.69^B ±0.25 (1.5-4) 2.70
BUN (mg/dL)	8.8-25.9	44.6^A ±9.48 (13-106) 37.5	17^B ±2.40 (8-29) 17
Cr (mg/dL)	0.5-1.4	3.083^A ±0.305 (1.8-4.83) 2.8	1.47^B ±0.235 (1.1-1.8) 1.6
USG	1.015-1.030	1.0158^A±0.0022 (1.001-1.023) 1.0185	1.0238^B±0.0012 (1.016-1.029) 1.025

*Ref: Textbook of Small Animal Practice Saunders 3rd edition (2006)
[1]Mean
[2]Figures in parentheses indicate range
Values in different rows with different alphabets differ significantly at P≤0.05 as compared to control
The statistical analysis of the data was performed with help of t- test, one way ANOVA and Pearson's correlation using SPSS statistics. Post hoc Dunkens's test was used for determination of the significant difference among the means

count, neutrophil count, BUN and creatinine along with urinary specific gravity can be collectively used for early diagnosis of AKI in dogs. It was concluded that timely diagnosis of exact etiology and aggressive treatment including diuresis with fluids, renal protectants, antimicrobials and other supportive care can help in reversibility and better prognosis.

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